



TECHNICAL MEMORANDUM

Date: August 27, 2009

To: James Smith, NMEMNRD
John Kretzmann, NMEMNRD

Project No.: 073-80026

Company: NMEMNRD MMD AML

From: Jeffrey Clark, Golder Associates Inc.

cc: Bob Newcomer, Golder Associates Inc.

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RE: AML FEATURES AND RECLAMATION APPROACHES

1.0 INTRODUCTION

Golder Associates Inc. (Golder) is under contract to the Abandoned Mine Land (AML) Program of the Mining and Minerals Division (MMD), to provide services relating to the closure of mine openings and reclamation of abandoned uranium mine lands (AUMs) in the Poison Canyon area of the Grants Uranium District. Limited field investigations were completed in March and June of 2009 for eight mine areas along Haystack Road approximately one to two miles west of New Mexico State Highway 605. The mine areas have been previously identified as: Barbara J #1, #2, #3, and #3a, Piedra Trieste, Roundy, T-20, and Flat Top (Figure 1).

In general, the field investigations consisted of measuring the ground level radiation (gamma ray) at survey points along transects on approximately 50 to 100-foot intervals. The AML Program had previously identified areas of surface disturbances for the various mine areas, and transects were located to cover these and the immediately surrounding areas. AUM features encountered during the completion of the radiological survey were documented using a GPS to record the location. During the completion of the field investigations AUM features were also encountered in areas outside of the survey transects. The field investigations have resulted in the mapping of the radiological hazards and many previously undocumented AUM features, which pose a significant public health and safety hazard. It is also likely that additional AUM features are present in these areas, which were not encountered during this field investigation, especially in areas outside of the survey transects.

Details of the radiation survey and the relationship between the measured radiation to uranium/radium concentrations are provided to the AML under separate cover. This technical memorandum describes the AUM features with regards to the three stated reclamation priorities for abandoned mine lands, as well as possible closure approaches.

1.1 Reclamation Priorities

The AUM physical features mapped by Golder during field investigation have been categorized for reclamation priority. The prioritization for reclamation under the AML Program is as follows:

1. Protection of public health, safety, general welfare and property from extreme danger resulting from the adverse effects of past mineral mining practices.
2. Protection of public health, safety and general welfare from adverse effects of past mineral mining and processing practices, which do not constitute an extreme danger.
3. Restoration of eligible lands and waters and the environment previously degraded by adverse effects of past mineral mining and processing practices, including measures for the conservation and development for soil, water (excluding channelization), woodland, fish and wildlife, recreation resources, and agricultural productivity.

2.0 AUML FEATURES, RISKS, AND RECLAMATION PRIORITY RANKINGS

The following sections detail the AUML features encountered during the field investigation, the risks each feature poses to public health and safety and the environment, followed by the reclamation priority ranking for each feature.

2.1 AUML Features

The following AUML features were encountered during the field investigations.

- **Mine equipment** – Mine equipment included items such as drill steel, hoist, and other equipment and parts. Minor amounts of mine equipment were generally present at each investigation area.
- **Concrete pads** – Concrete pads were generally small and appear to be foundations for buildings and mine equipment (e.g. hoists, headframes). One or more concrete pads are present at most of the mine areas. No buildings or other structures remain in the mine areas.
- **Trash and debris piles** – Trash and debris piles included both mine related (e.g. headlamps, batteries, timbers, etc.) and household type wastes (e.g. bottles, cans, etc.). To various extents, trash and debris was encountered in each mine area.
- **Waste rock piles and disturbed areas** – Waste rock piles are generally composed of medium to coarse gravel and cobble sized limestone (the mineralized Todilto Limestone was the mined formation in the investigation areas) and less than 6-feet tall; however, the largest pile is approximately 20-feet tall at the tallest outslope. Disturbed areas generally had a superficial covering, likely less than 6-inches thick, of fine to coarse gravel sized limestone and may be former ore load-out areas or working areas (e.g. laydown yards). At the Barbara J #2 area, some of the disturbed areas also had possible utilities (i.e. PVC and HDPE pipe) sticking out of the ground. No investigation of the depth of the waste rock piles or disturbed areas was conducted. Waste rock piles and disturbed areas were encountered at each mine area.
- **Possible mine openings with intact covers** – Possible mine openings with intact covers are noted as such when the presence of timbers or metal plates suggests intentional placement, or when the location corresponds to a feature previously mapped by the AML program. Due to safety concerns, no additional investigation of these features was conducted; the presence or absence of a mine opening could not be confirmed. These features were encountered at the Barbara J #3, Piedra Trieste, Roundy, T-20, and Flat Top areas.
- **Surface expressions of subsidence** – Surface expressions of subsidence range in size from approximately 3-feet in diameter and 3-feet deep, to approximately 35-feet in diameter and 15-feet deep. Subsidence features were present with both rounded bottoms (i.e. widest at the surface) and also as holes which appear to open wider with depth. These features were encountered only in the Barbara J #2, Piedra Trieste, and Flat Top areas.

- **Cased boreholes** – These features have a 1-foot diameter steel casing at the ground surface. A weighted measuring tape was lowered down the eastern borehole to a total depth of approximately 296-feet below ground surface (ft BGS). When retrieved, the lower 95-feet of measuring tape was muddied and wet suggesting groundwater at approximately 200-ft BGS. These cased boreholes (two) near the Barbara J #3 area were potentially drilled as water supply wells.
- **Exploration boreholes** – Exploration boreholes are generally six inch diameter holes which have widened at the surface to approximately two feet in diameter. Generally, the boreholes have been backfilled (or collapsed) such that the holes are open to total depths of between two and 10-ft BGS. The total depths of the boreholes were generally not measured; however, of the more than 50 boreholes encountered approximately 10-15% are expected to exceed 10-ft BGS. The deepest total depth measured was approximately 65-ft BGS. No water was observed in any of the exploration boreholes. Exploration boreholes were encountered in each mining area. No water was observed in any of the exploration boreholes.
- **Previously closed mine openings with failing closures** – Three mine openings, one at Barbara J #1, one at Piedra Trieste, and one at Flat Top, were previously closed by mounding backfill over the mine opening. The backfill has subsequently subsided into the mine openings resulting in open holes at the ground surface. These openings are not very deep (total depths of approximately 10-ft or less) but the opening may grow if the subsidence continues unabated.
- **Open mine shafts** – A total of nine open mine shafts were encountered at Barbara J #2 and #3, Flat Top, T-20, and outside of the mine areas to the south of Barbara J #3, and northeast of T-20. These features are large enough for a person to completely enter. Most of these mine openings appear to be unlined ventilation shafts with opening diameters of approximately 2 to 5-ft and total depths ranging from approximately 15 to 74 ft BGS (the total depth of one opening near Barbara J #3 was not measured). No water was observed in any of open mine shafts.

Examples of the AURL features can be found in the photo log included as Attachment A.

2.2 Ranking Reclamation Priority for AURL Features

To determine the reclamation priority of the various AURL features, Golder has prepared a simplified prioritization based on relative risk and the potential hazards posed by each AURL feature. Potential hazards include: public health and safety incidents, environmental impacts, and property loss (e.g. injury to or loss of livestock or damage to vehicles).

2.2.1 Risk Classification of AURL Features

The risk associated with a AURL feature was determined using the risk classification matrix shown on Table 1. The risk classification matrix assigns a relative risk category based on the probability or frequency and potential consequence of an incident.

TABLE 1
RISK CLASSIFICATION MATRIX

PROBABILITY OR FREQUENCY	CONSEQUENCE				
		1 – Very Low	2 – Low	3 – Moderate	4 – High
	4 – High	Class II	Class III	Class IV	Class IV
	3 – Moderate	Class I	Class II	Class III	Class IV
	2 – Low	Class I	Class II	Class III	Class IV
	1 – Very Low	Class I	Class I	Class II	Class III

The A UML features, and the potential hazards associated with them, are classified according to the relative risk categories in Table 2. For risk classification purposes, Golder has made the following assumptions:

- A high probability event has a greater than 75% chance of occurring, or one event per year; a very low probability event has a 0.1% chance of occurring, or one event per 100 years.
- Consequences range from fatality or significant widespread environmental impacts (high consequence), to a first aid case or isolated short term environmental impact (very low).
- Public use of the land is limited; only occasionally are people near the AUML features.
- The land use is both recreational (e.g. hiking, off-road vehicles) and agricultural (i.e. ranching).
- Features with greater visibility (e.g. mine equipment, debris) will have a lower incident probability than those openings (e.g. subsidence features, mine shafts, and boreholes) which may be encountered accidentally and obscured by vegetation.
- Exploration boreholes and mine shafts do not penetrate an aquifer.
- The deep cased boreholes have the potential of environmental impacts to groundwater.
- Environmental impacts of other features consist of the loss of agricultural land.
- Potential mine openings with intact covers:
 - covers are stable and offer protection against accidental entrance, and
 - underlying openings are large enough for complete entrance without egress.

TABLE 2
RISK CLASSES FOR POTENTIAL HAZARDS

Physical Feature	Potential Hazards	Probability Ranking	Consequence Ranking	Risk Class
Mine Equipment	Fall from or collision with and environmental impact.	1	2	I
Concrete Pads	Trip and fall at ground level and environmental impact.	1	1	I
Trash and Debris Piles	Trip and fall at ground level and environmental impact.	2	2	II
Waste Rock – Low Level Radioactivity	Environmental impact and radiation exposure.	3	2	II
Waste Rock – Elevated Radioactivity	Environmental impact and radiation exposure.	3	3	III
Covered Mine Openings	Trip and fall at ground level, fall into, and environmental impact.	1	4	III
Surface Subsidence	Thrown from vehicle, fall into, and environmental impact.	3	3	III
Cased Boreholes	Collision with, trip, environmental impact, and injury to livestock.	2	4	IV
Exploration Boreholes	Thrown from vehicle, trip, and injury to livestock.	2	3	III
Previously Closed and Subsided Mine Shafts	Fall into, loss of livestock, and environmental impact.	2	4	IV
Open Mine shafts	Fall into, loss of livestock, and environmental impact.	2	4	IV

2.2.2 Reclamation Priority Rankings

To assign a reclamation priority ranking, Golder has equated the four risk classification categories with the three AML program reclamation priorities as follows:

- Features of Risk Class IV meet the requirements of Reclamation Priority 1,
- Features of Risk Class III meet the requirements of Reclamation Priority 2, and
- Features of Risk Classes I and II meet the requirements of Reclamation Priority 3.

Features having Risk Class IV hazards pose extreme danger to public health and safety or the environment. These Reclamation Priority 1 features include the two cased boreholes near Barbara J #3 and the twelve mine openings large enough for a person to enter completely (Figures 2 and 3). The two cased boreholes present an extreme environmental hazard by serving as a conduit for impacts to reach groundwater; additionally they pose a safety risk to people and loss of process risk (i.e. injury to livestock). The three previously closed mine shafts into which the mounded backfill has subsequently subsided pose an extreme safety risk because a person could completely enter the opening and become trapped. The nine open mine shafts pose an extreme public safety risk and property loss (i.e. loss of livestock) because a person or animal could enter the opening.

Features of Risk Class III present hazards to public health and safety or the environment, which do not constitute an extreme danger. These Reclamation Priority 2 features include the covered mine openings, areas of elevated radioactivity, surface subsidences (eleven), and exploration boreholes (approximately 50); these features can be found on Figures 2 and 3. While it is possible that these features could be involved in a fatal incident for an all-terrain vehicle rider (recreational land use), this may be attributed more to the inherent danger of the activity than the presence of the AUML feature; this risk exists for naturally occurring features such as animal burrows and arroyos. The eight covered mine openings appear to be stable, the potential for failure and catastrophic entrance exists. The areas of elevated radioactivity, particularly the larger areas, present a chronic health risk by radiation exposure; small areas of elevated radiation present the same risk, but at lower probability. Shallow openings resulting from surface subsidence present a moderate safety and loss of process risk in which a person or animal be injured falling into the opening. Exploration boreholes present a moderate safety risk in which a person or animal be injured stepping into the opening, or a loss of property risk for vehicles damaged by hitting the opening.

Features of Risk Class II and I present low risk to public health and safety and are largely environmental impacts. These Reclamation Priority 3 features include the remaining impacts resulting from the mine features: trash and debris, concrete pads, and waste rock and disturbed areas of low radioactivity. These features present negligible risk to public health and safety and the environment.

3.0 RECLAMATION CLOSURE OPTIONS

The following sections cover potential closure options for the Reclamation Priority 1 and 2 features. Golder understands that Reclamation Priority 3 features are not to be addressed until reclamation of Priority 1 and 2 features has been completed; therefore, closure options for Reclamation Priority 3 features are not addressed at this point. Golder has assumed that the AUML features are not wildlife habitat and that no additional wildlife access features (e.g. bat cupolas) will be required for closure. For each feature type, generic reclamation options with minimal, moderate, and high levels of effort are considered.

3.1 Borrow Materials

Many of the reclamation options below will require borrow materials, for use as fill and/or as final cover. No investigation for suitable borrow sources has been completed at this time. Surficial materials throughout the area, excepting waste rock, are composed of fine grained sand with silt. The high erosion potential of these materials will necessitate outcrops of low grades if used as cover.

3.2 Cased Boreholes

These features present an extreme danger to the environment and therefore action should be taken to reduce or remove the hazard; a no-action option has not been considered. The minimal effort closure action that could be taken to reduce the hazard is to weld a cap onto the casing so that people, objects, and surface water cannot enter the hole.

- Advantages of this closure method include:
 - Low cost of labor and materials, and
 - Does not require new access roads.
- Disadvantages of this closure method include:
 - Does not eliminate the hazard, and
 - Does not comply with Office of the State Engineer (OSE) borehole abandonment regulations.

A moderate level of effort closure action for cased boreholes is to backfill the opening using lifts of cement grout and locally derived materials.

- Advantages of this closure method include:
 - Removes the hazard, and
 - Lower material most than high level of effort option.
- Disadvantages of this closure method include:
 - Requires abandonment plan design be approved by the OSE, and
 - Labor/cost intensive.

A high level of effort closure action is to completely backfill the hole using cement grout.

- Advantages of this closure method include:
 - Complete removal of the hazard, and
 - Ease of approval by the OSE.
- Disadvantages of this closure method include:
 - Increased material cost.

3.3 Mine Shafts

The hazards presented by the previously closed shafts with subsequent subsidence, the open shafts, and the possible covered shafts are largely the same, therefore, the same closure options will be considered for these features. These features present an extreme danger to public health and safety and therefore action should be taken to reduce or remove the hazard; a no-action option has not been considered.

The minimal effort closure action that could be taken to reduce the hazard posed by the large mine openings is to prevent entry by placement of a solid surface cover (i.e. wooden, solid or mesh steel, or concrete cap), and/or erecting fencing around the opening. Placement of a surface cover or erecting fencing and signage should reduce the risk of accidental entry.

- Advantages of this closure method include:
 - Reduced labor and materials,
 - Can be completed without using heavy equipment, and
 - Does not require new access roads.
- Disadvantages of this closure method include:
 - Does not eliminate the hazard, and

- Long term maintenance.

A moderate level of effort closure action for the large mine openings is to backfill the opening, with a mound at the surface, as was previously completed at three openings. In addition, fencing and signage could be erected around the area.

■ Advantages of this closure method include:

- Temporarily removes the hazard of accidental entry,
- Moderate engineering design, and
- Possible disposal location for some waste rock.

■ Disadvantages of this closure method include:

- Requires use of heavy equipment,
- Requires new access roads,
- Requires development of a borrow area or imported materials, and
- Subsidence of the backfill is likely and would require maintenance.

A high level of effort closure action for the large mine openings is to backfill the opening, with an engineered cap, such as geogrid or a torroid mat, at the surface. If this closure effort is selected, additional field investigation would be required to complete the closure design; additionally, fencing and signage could be erected around the area.

■ Advantages of this closure method include:

- Removes the hazard of accidental entry,
- Possible disposal location for some waste rock, and
- Reduced maintenance.

■ Disadvantages of this closure method include:

- Requires additional investigation
- Higher level engineering design,
- Requires use of heavy equipment,
- Requires new access roads, and
- Requires development of a borrow source or imported materials.

3.4 Exploration Boreholes

Exploration boreholes present a moderate safety and property loss risk in which a person or animal may be injured stepping into the opening, or a property loss for vehicles damaged by hitting the opening. The hazards presented by the exploration boreholes are largely independent of the depth. These features present a danger to public health and safety and therefore action should be taken to reduce or remove the hazard; a no-action option has not been considered. It is assumed that each closure option could be completed without the use of heavy equipment and no new access roads would be required (i.e. materials can be brought to each borehole using a 4-wheel drive vehicle).

The minimal effort closure action that could be taken to reduce the hazard posed by the boreholes is to prevent entry by placement of a solid surface cover (i.e. wooden, steel, or concrete cap) over the opening. Placement of a solid surface cover should reduce the risk of accidental entry.

- Advantages of this closure method include:
 - Completed quickly.
- Disadvantages of this closure method include:
 - Does not remove the hazard, and
 - May require frequent maintenance.

A moderate level of effort closure action for the boreholes is to backfill the opening using locally-derived borrow materials.

- Advantages of this closure method include:
 - Removes the hazard of accidental entry,
 - Low cost of materials, and
 - Can be completed without using heavy equipment.
- Disadvantages of this closure method include:
 - Materials will settle over time (deep boreholes may require maintenance), and
 - Requires development of a borrow source.

A high level of effort closure action for the boreholes is to backfill the opening with a cement surface completion.

- Advantages of this closure method include:
 - Removes the hazard, and
 - Reduces long term maintenance over backfilling with native material only.
- Disadvantages of this closure method include:
 - The cement completion presents an environmental impact,
 - Increased material and labor cost over backfilling with native material only, and
 - Requires development of a borrow source.

3.5 Subsidence Features

Subsidence features present a moderate safety and property loss risk in which a person or animal be injured falling into the opening, or a loss of process risk for vehicles damaged by hitting the opening. The hazards presented by the exploration are largely independent of the depth. These features present a danger to public health and safety and therefore action should be taken to reduce or remove the hazard; a no-action option has not been considered.

The minimal effort closure action that could be taken to reduce the hazard posed by the subsidence features is to prevent entry by erecting fencing and signage around and/or over the opening. Fencing should reduce the risk of accidental entry.

- Advantages of this closure method include:
 - Low labor cost,
 - Can be completed without using heavy equipment,
 - Does not require new roads, and
 - Can be completed quickly.
- Disadvantages of this closure method include:
 - Does not remove the hazard, and
 - Long term maintenance.

A moderate level of effort closure action for the subsidence features is to backfill the opening using locally derived borrow materials with a mound at the surface. In addition, fencing and signage should be erected around the area.

- Advantages of this closure method include:
 - Possible disposal location for some waste rock,
 - Removes the hazard of accidental entry, and
 - Low cost of materials.
- Disadvantages of this closure method include:
 - Loading caused by the backfill may propagate the subsidence,
 - Requires heavy equipment and possibly new roads,
 - Long term maintenance, and
 - Requires development of a borrow source.

A high level of effort closure action for the subsidence features is to backfill the opening with native materials and placing and engineered cover (e.g. torroid mat, or geogrid). If this closure effort is selected, additional field investigation would be required to complete the closure design (i.e. determine the extent of the void space); additionally, fencing and signage should be erected around the area.

- Advantages of this closure method include:
 - Removes the hazard of accidental entry,
 - Possible disposal location for some waste rock, and
 - Reduces long term maintenance over backfilling with native material only.
- Disadvantages of this closure method include:
 - Requires additional investigation,
 - Increased engineering cost,
 - Increased material and labor cost,
 - Requires heavy equipment and possibly new roads, and
 - Requires development of a borrow source.

3.6 Areas of Elevated Radioactivity

The areas of elevated radioactivity present a public health hazard from chronic exposure. Radiation exposure is a function of activity, and duration, both the activity level (e.g. concentration) and the areal extent should be considered; therefore, the largest areas of high concentrations present the greatest hazard. Figures 2 and 3 present the 30 and 100 pico-Curie per gram (pCi/g) ^{226}Ra -equivalent predicted concentration isopachs and the approximate areal extent. The predicted concentrations are based on the gamma radiation measurements collected at the ground surface during the field investigation.

The minimal level of effort action could be to complete reclamation at only the large 100 pCi/g ^{226}Ra areas (e.g. areas exceeding 1000 square feet). A moderate level of effort action could be to complete reclamation of all 100 pCi/g ^{226}Ra areas, and a high level of effort action could be to complete reclamation at all areas exceeding 30 pCi/g ^{226}Ra . Areas exceeding 30 pCi/g ^{226}Ra can be found on Figures 2 and 3.

The level of effort will be determined by the action limit, combined with the reclamation approach. The full development of potential reclamation options is pending the determination of action limits; the action limits will determine the area and volume of material that will require reclamation. Possible reclamation approaches include:

- Using the material as backfill in mine shafts and subsidence features. Although volume estimates have not been completed, the amount of reclamation material is likely to exceed the amount required to backfill the mine openings in the investigation area; an additional closure method would be required for remaining materials.
- Consolidating and covering materials. Materials of elevated radioactivity (i.e. waste rock) would be consolidated into one or more closure 'cells' and covered with 'clean' borrow material. Potential sources of cover materials include: locally at the cell location (e.g. excavated prior to placing waste rock), from an on-site borrow area, and imported from off-site.
 - Multiple cells – Waste rock would be consolidated from nearby action areas into a local cell.
 - Single cell – Waste rock from all action areas would be consolidated into a single cell.

The primary advantage of the multiple cell approach would be shorter haul distances from the source to the cell. A single cell approach may require less cover (design dependent) and may have a long term advantage in that maintenance will only be required for one facility.

4.0 CONCLUSIONS

Golder identified eleven types of AML features at the seven mine areas investigated. A simple risk analysis was completed to categorize the features according to the AML Reclamation Priorities (Section 1.1) based on the risks to human health and safety, the environment, and loss of process. The risk assessment resulted in two Reclamation Priority 1 feature types: the two cased boreholes near Barbara J #3 and the twelve mine openings large enough for a person to enter completely; and four Reclamation Priority 2 feature types: eight possible mine openings with intact covers, areas of elevated radioactivity (number of areas is dependent on the action limit), eleven surface subsidence, and approximately 50

exploration boreholes. For each of these feature types, Golder has identified possible approaches for reclamation/closure.

In a meeting with Golder, the AML Program made the following decisions:

- The risk classification for potential hazards, and reclamation priorities, of the A UML features was accepted as contained in the Sections 2.
- Golder shall continue with closure designs for the reclamation priority 1 and 2 A UML features.
- Closure of mine openings shall be completed by backfilling using available materials.
- Waste rock is suitable for use as fill material for mine openings in which water is not encountered.
- The large mound in the vicinity of the former Roundy mine is assumed to be composed of clean native materials suitable for use as cover.
- The action limit for reclamation of radioactive materials (based on predicted concentrations) shall be 1 00 pCi/g ²²⁶Ra, however, removal actions shall generally be visually based with confirmation by radiation survey. Closure designs therefore will be based up on the more conservative 30 pCi/g ²²⁶Ra isopach which should more closely conform to the extent of visually identifiable waste rock.
- Reclamation of radioactive materials shall be completed by using materials as backfill in the large mine openings with remaining materials consolidated into three cells.
 - The cells will be located in the vicinity of the former Barbara J #3, Flat Top, and Roundy mines.
- Prior to developing a closure approach for the two cased boreholes:
 - The OSE well registry will be searched to see if the boreholes were registered as wells, and
 - The New Mexico Environment Department (NMED) will collect groundwater samples and determine if the boreholes might be desirable for future groundwater monitoring.
- Final cover shall consist of a minimum of approximately 18 inches of 'clean' material.
- Final cover surfaces shall be roughened and broadcast seeded.

Attachments:

Figure 1 – Site Location Map

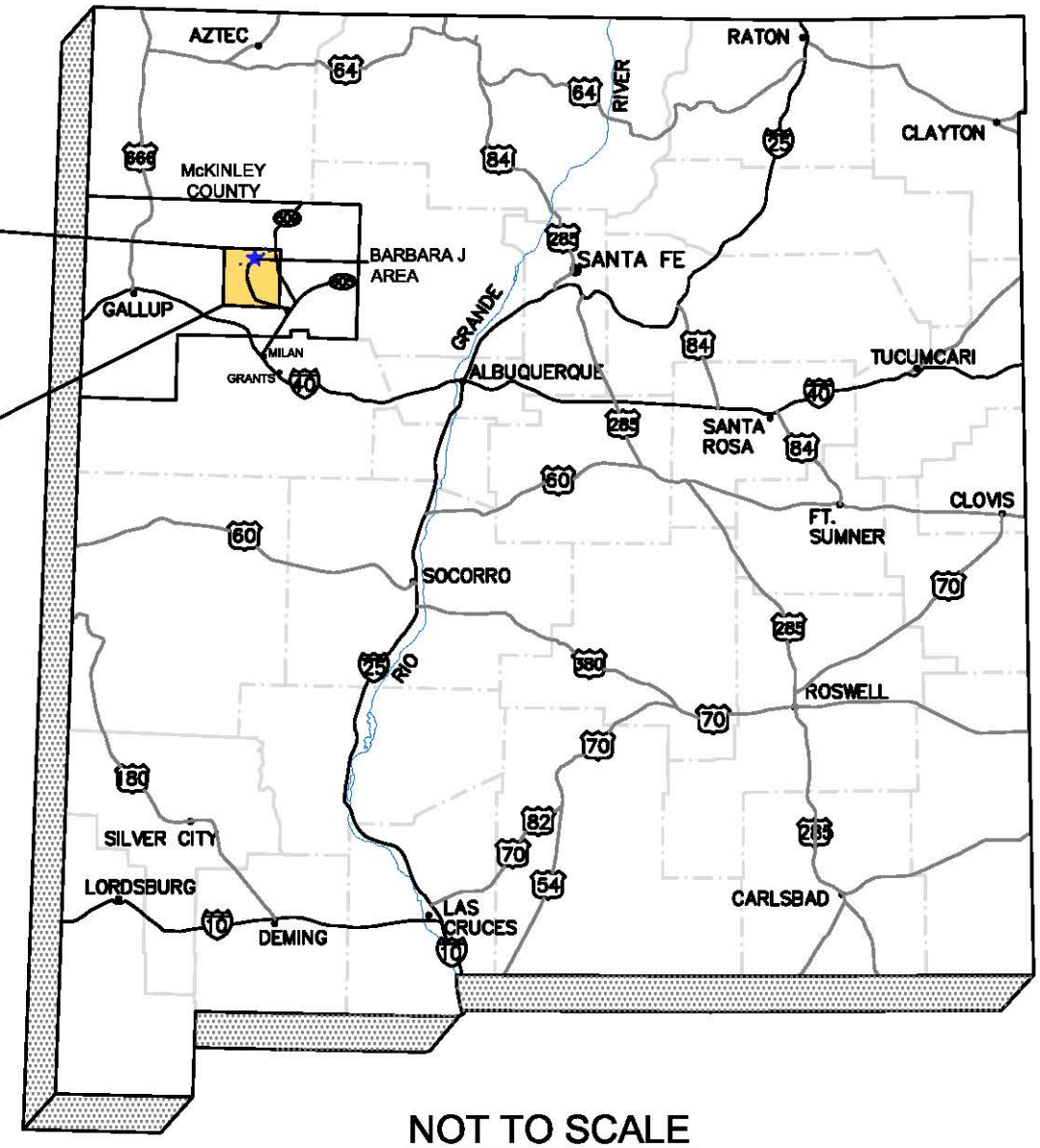
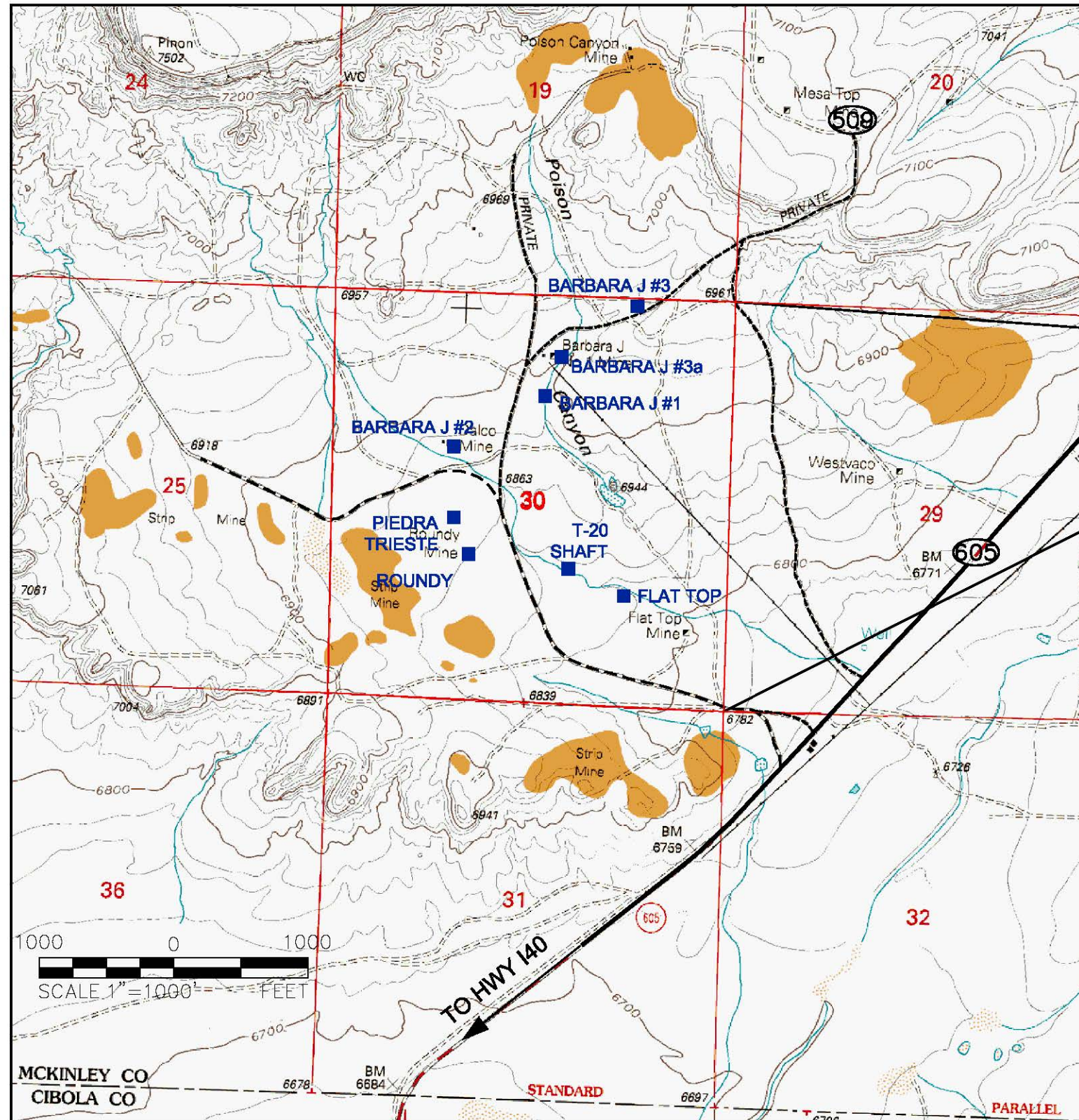
Figure 2 – Priority 1 and 2 Reclamation Features – North Area

Figure 3 – Priority 1 and 2 Reclamation Features – South Area

Attachment A – A UML Features Photo Log

FIGURES

Drawing file: Barbara J Site.dwg Aug 25, 2009 -- 9:20am




NOT TO SCALE

LEGEND

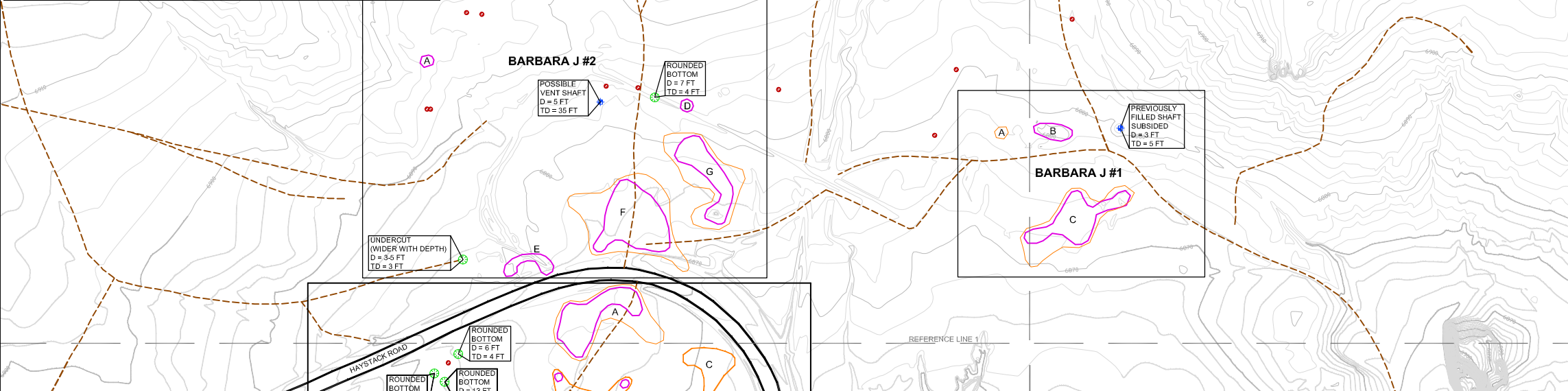
- APPROXIMATE ABANDONED URANIUM MINE SITE (FROM AML UTM)
- HIGHWAY
- - - COUNTY ROAD
- - - - DIRT ROAD

NOTE: APPROXIMATELY 10.5 MILES FROM 140 TO BARBARA J TURN OFF.

PROJECT NEW MEXICO ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT ABANDONED MINE LANDS PROGRAM McKinley County, New Mexico			
TITLE POISON CANYON AREA LOCATION MAP			
 Golder Associates Albuquerque, New Mexico	PROJECT No.	083-80040	FILE No. Barbara J Site.dwg
	DESIGN	FJ	08/13/08
	CADD	CM	07/07/09
	CHECK	FJ	07/07/09
	REVIEW	BN	07/07/09
SCALE AS SHOWN			REV. 1
FIGURE 1			

Drawing file: Topo jc.dwg Jul 01, 2009 - 12:45pm

100 pCi/g		30 pCi/g		Difference
AREA	SQUARE FEET	AREA	SQUARE FEET	SQUARE FEET
Barbara J #1		Barbara J #1		Barbara J #1
A	0	A	600	600
B	2600	B	2600	0
C	11800	C	20200	8400
Subtotal	14400	Subtotal	23400	9000
Barbara J #2		Barbara J #2		Barbara J #2
A	600	A	600	0
B	0	B	300	300
C	1000	C	1000	0
D	600	D	600	0
E	3000	E	3000	0
F	18400	F	34000	15600
G	9900	G	21000	11100
Subtotal	33500	Subtotal	60500	27000
Barbara J #3		Barbara J #3		Barbara J #3
A	1000	B	1000	0
B	5900		21300	14100
B	700			
B	600	C	22700	8000
C	14700	D	2700	0
D	2700	E	15800	9300
E	6500	F	2600	0
F	2600	G	600	600
G	0	Subtotal	66700	32000
Subtotal	34700	Subtotal	66700	32000
Barbara J #3A		Barbara J #3A		Barbara J #3A
A	15200	A	15200	0
B	600	B	600	0
C	0	C	500	500
Subtotal	15800	Subtotal	16300	500



LEGEND

- A

RECLAMATION PRIORITY 2 FEATURE
RADIATION ISOPACH WITH AREA LABELS:
30-100 pCi/g Ra-226
- A

>100 pCi/g Ra-226
- 6988

MAJOR AND MINOR TOPOGRAPHIC
CONTOURS
- ==

ROADS
- RECLAMATION PRIORITY 2 FEATURE
DRILLHOLE LOCATION
- ★

POSSIBLE
VENT SHAFT
D = 5 FT
TD = 35 FT
- ★

CASED HOLE
POSSIBLE WELL
D = 1 FT
TD = 296 FT
- ★

ROUNDED
BOTTOM
D = 7 FT
TD = 4 FT
- ★

TIMBERS
4 FT x 5 FT
POSSIBLE
SHAFT COVER
- ★

RECLAMATION PRIORITY 1 FEATURE
OPEN MINE SHAFT AND SUBSIDED CLOSURES
D = APPROXIMATE DIAMETER
TD = APPROXIMATE TOTAL DEPTH
- ★

RECLAMATION PRIORITY 1 FEATURE
BOREHOLE WITH STEEL CASING
D = APPROXIMATE DIAMETER
TD = APPROXIMATE TOTAL DEPTH
- ★

RECLAMATION PRIORITY 2 FEATURE
SURFACE SUBSIDENCE
D = APPROXIMATE DIAMETER
TD = APPROXIMATE TOTAL DEPTH
- ★

RECLAMATION PRIORITY 2 FEATURE
POSSIBLE COVERED SHAFT

NOTES

- TOPOGRAPHIC CONTOURS PROVIDED BY NEW MEXICO ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT.
- DRILLHOLES ARE GENERALLY 6-INCHES IN DIAMETER WITH SURFACE EXPRESSIONS OF 2- FEET IN DIAMETER. DEPTHS VARY FROM APPROXIMATELY 2- FEET TO 65- FEET BELOW GROUND SURFACE.
- RADIATION ISOPACHS BASED ON PREDICTED RADIUM-226 (Ra-226) CONCENTRATIONS IN PICO-CURIES PER GRAM (pCi/g) BASED ON FIELD GAMMA RADIATION MEASUREMENTS.
- WHERE ONLY THE 100 pCi/g ISOPACH IS SHOWN, THE 30 pCi/g ISOPACH IS ASSUMED TO BE APPROXIMATELY THE SAME.
- RADIATION ISOPACH AREAS ARE APPROXIMATE; ACTUAL AREAS WILL BE DETERMINED DURING RECLAMATION DESIGN.



PROJECT

NEW MEXICO ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT
ABANDONED MINE LANDS PROGRAM
McKinley County, New Mexico

TITLE

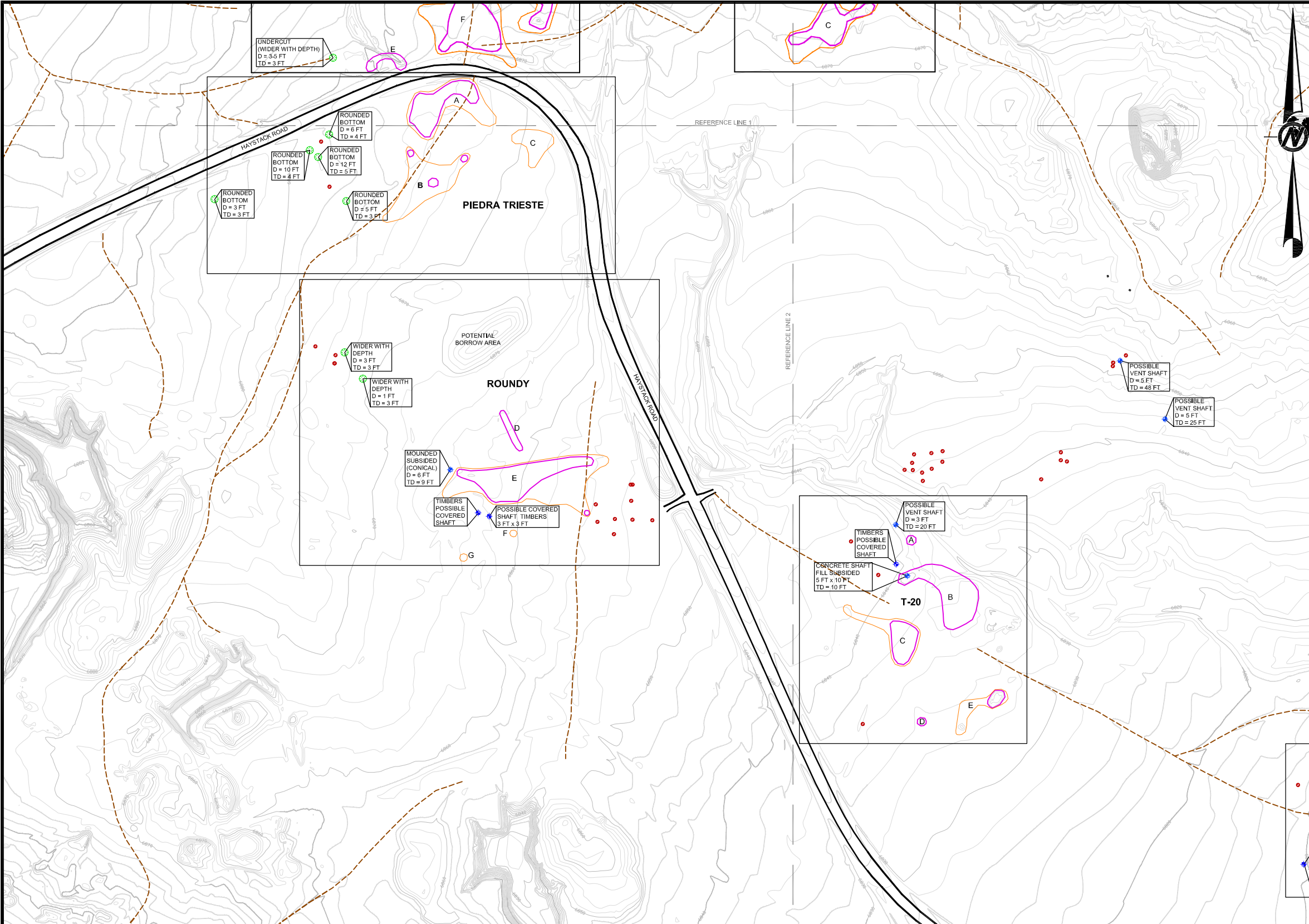
RECLAMATION PRIORITY 1 AND 2
FEATURES - NORTH AREA

Golder
Associates
Albuquerque, NM

PROJECT No.	073-80026	FILE No.	07380026.A001
DESIGN	JAC	7-1-09	SCALE AS SHOWN REV. 1
CADD	JAC	7-1-09	
CHECK	JAC	8-24-09	
REVIEW	RN	8-25-09	

FIGURE 2

Drawing file: 07380026.A001r1r.dwg Aug 25, 2009 9:05am



100 pCi/g		30 pCi/g		Difference
Piedra Trieste		Piedra Trieste		Piedra Trieste
A	12800	A	22300	9500
B	300	B	19700	18600
B	300			
B	500			
C	0	C	7000	7000
D	2100	D	2100	0
E	21000	E	44700	23500
E	200			
F	0	F	300	300
G	0	G	400	400
Subtotal	37200	Subtotal	96500	59300
T-20		T-20		T-20
A	600	A	600	0
B	19000	B	19000	0
C	7000	C	12300	5300
D	500	D	500	0
E	1700	E	6100	4400
Subtotal	28800	Subtotal	38500	9700
Flat Top		Flat Top		Flat Top
A	400	A	400	0
B	6200	B	6200	0
C	4700	C	4700	0
D	0	D	300	300
E	400	E	7500	4600
E	2500			
Subtotal	13800	Subtotal	18700	4900
TOTAL	178200	TOTAL	320600	142400

LEGEND

A	RECLAMATION PRIORITY 2 FEATURE RADIATION ISOPACH WITH AREA LABELS: 30-100 pCi/g Ra-226		POSSIBLE VENT SHAFT D = 5 FT TD = 35 FT	RECLAMATION PRIORITY 1 FEATURE OPEN MINE SHAFT AND SUBSIDED CLOSURES D = APPROXIMATE DIAMETER TD = APPROXIMATE TOTAL DEPTH
A	>100 pCi/g Ra-226		CASED HOLE POSSIBLE WELL D = 1 FT TD = 296 FT	RECLAMATION PRIORITY 1 FEATURE BOREHOLE WITH STEEL CASING D = APPROXIMATE DIAMETER TD = APPROXIMATE TOTAL DEPTH
	MAJOR AND MINOR TOPOGRAPHIC CONTOURS		ROUNDED BOTTOM D = 7 FT TD = 4 FT	RECLAMATION PRIORITY 2 FEATURE SURFACE SUBSIDENCE D = APPROXIMATE DIAMETER TD = APPROXIMATE TOTAL DEPTH
	ROADS		TIMBERS 4 FT x 5 FT POSSIBLE SHAFT COVER	RECLAMATION PRIORITY 2 FEATURE POSSIBLE COVERED SHAFT
	RECLAMATION PRIORITY 2 FEATURE DRILLHOLE LOCATION			

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PROJECT NEW MEXICO ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT
ABANDONED MINE LANDS PROGRAM
McKinley County, New Mexico

TITLE
**RECLAMATION PRIORITY 1 AND 2
FEATURES - SOUTH AREA**

Golder Associates
Albuquerque, NM

PROJECT No.	001-1001	FILE No.	07380026.A001
DESIGN	JAC	7-1-09	SCALE AS SHOWN REV. 1
CADD	JAC	7-1-09	
CHECK	JAC	8-24-09	
REVIEW	RN	8-25-09	

FIGURE 3

ATTACHMENT A
AUML FEATURES PHOTO LOG



Photograph 1: Mine equipment (unknown) north of T-20.



Photograph 2: Concrete pads at Barbara J #2.



Photograph 3: Trash and debris at Barbara J #3A.



Photograph 4: Mine equipment, trash, and waste rock at Barbara J #3.



Photograph 5: Large waste rock pile at Barbara J #3.



Photograph 6: Typical small waste rock piles and disturbed area.



Photograph 7: Disturbed area with utility stickups at Barbara J #2.



Photograph 8: Typical waste rock pile and disturbed area.



Photograph 9: Typical possible covered mine opening.



Photograph 10: Typical rounded bottom surface subsidence partially obscured by vegetation.



Photograph 11: Typical undercut surface subsidence partially obscured by vegetation.



Photograph 12: Cased borehole near Barbara J #3; 1-foot diameter, 296-foot total depth.



Photograph 13: Exploration borehole near T-20; 6-inch diameter, 65-foot total depth.



Photograph 14: Typical exploration borehole obscured by vegetation; wide depression at surface tapering to 6-inch diameter borehole, 3-foot total depth.



Photograph 15: Previously closed and subsided mine opening at Piedra Trieste; 6-foot diameter at surface tapering to 1-foot diameter at total depth of 9-feet.



Photograph 16: Previously closed and subsided mine opening at Barbara J #1; 3-foot diameter (estimated) at surface, 5-foot (estimated) total depth.



Photograph 17: Previously closed and subsided mine opening at T-20; 5x10-foot, 10-foot total depth.



Photograph 18: Typical open mine shaft obscured by vegetation; Barbara J #2, 5-foot diameter, 35-foot total depth.



Photograph 19: Typical open mine shaft; Flat Top, 3-foot diameter, 74-foot total depth.



Photograph 20: Typical open mine shaft; northeast of T-20, 5-foot diameter, 25-foot total depth.